

**La Paz Community School**

**12th Math Studies**

**SIOP LESSON: Logics**

**I PART:** Read the following story supposing that every proposition is true and answer the questions.

“Charles is a good student in La Paz Community School. Every day, he plays soccer or tennis but not both. If today is Monday or not a day which first letter is T then he doesn’t play tennis. If Charles plays soccer then he drinks Gatorade to avoid dehydration. Today is Friday. A day is not on weekend (from Monday to Thursday) if and only if Charles study Math at night. If Charles plays tennis and study math at night then the next day he eats pinto for breakfast.”

Tell if the following propositions are true or false. Explain.

1. Today is Thursday
2. Charles play tennis today
3. Charles drinks Gatorade
4. Charles study Math at night
5. Charles will eat pinto for breakfast tomorrow.

**II PART:** Complete the following table with the basic logic symbols:

	Symbol	Is true When?	Given that:	Translation to words.
Negation of $p$			$p$ : The sun is shining	
$p$ and $q$			$p$ : Math is fun $q$ : Math is useful	
$p$ or $q$			$p$ : Today is Thursday $q$ : I eat an apple	
$p$ exclusive or $q$			$p$ : I drink coffee $q$ : I drink Orange juice	
Implication  $p$ implies $q$			$p$ : We have full moon $q$ : Zombies are coming out.	
Equivalence  $p$ is equivalent to $q$			$p$ : Pay attention in class. $q$ : Good grades in Math.	

**III PART:** Truth table. Complete the following truth table:

$p$	$q$	$\neg p$	$\neg q$	$p \wedge q$	$p \vee q$	$p \underline{\vee} q$	$p \Rightarrow q$	$p \Leftrightarrow q$
T	T							
T	F							
F	T							
F	V							

**IV PART:** For the implication  $p \Rightarrow q$ , the following propositions have a special name:

OPPOSTITE:  $\neg p \Rightarrow \neg q$

RECIPROCAL:  $q \Rightarrow p$

CONTRAPOSITIVE:  $\neg q \Rightarrow \neg p$

- Using a truth table, state relations between the truth values for those propositions.

2. Consider the following implication: "If I go to bed late, then, I will be sleepy the next day". Write down in words the opposite, the reciprocal and the contrapositive of that proposition.

**V PART:** Tautology and contradiction. Make a truth table for  $p \vee \neg p$  and  $p \wedge \neg p$ . State which one is a contradiction or tautology. Write in words one example.